

# 2010-09-08 Kicker Meeting

Wednesday, September 08, 2010  
12:06 PM

Attendance: Morgan, Vander, Drendel, Leveling

## Mu2e era Accumulator Injection Kicker:

- Pbar era A:EKIK tank
  - Tank will be removed
  - Tank will be refurbished and modified
  - The three modules will run in parallel
  - Tank will be installed at Pbar era A:IKIK location where it will be used as the Mu2e era Accumulator Injection Kicker.
- Pbar era A:IKIK tank
  - Will be removed
  - Will be rebuilt to match the Mu2e era Accumulator Injection kicker
  - Will be used as a spare
- Kicker Specs
  - Flat top > 1.6 micro-sec (81 bunches is ~1.54 micro sec)
  - Rise time - Does not matter
  - Fall time - 40 nsec. We have to fit the gap of ~3 bunches (57nsec)
  - Total kick = 4 mrad
  - Magnets = 3
  - Integrated magnetic field = 1.2 KG-m
  - Every Nova cycle, we will have six Mu2e pulses over 20 fifteen Hz ticks.
    - Duty cycle = 30%
    - Burst rate = 15Hz
  - Insertion Length = Installed in the existing Pbar era A:IKIK location.
- Will use a bumper magnet to compensate for ringing on the tail of the falling edge of the kicker. We will need to find a good location in the lattice to put this magnet.
- Though the existing tank will be used, we will need a new power supply.

## Mu2e era Accumulator Extraction Kicker

- Will acquire the unused Tevatron proton injection kicker system
- Kicker Specs
  - Flat top = 250 nsec
  - Rise time = 100 nsec
  - Fall time = 100 nsec
  - Total kick = 4 mrad
    - The Tevatron system has five magnets (we will only use three) with a total kick of 6.7mrad. Three kickers will give us ~3.84mrad.
  - Magnets = 3
  - Integrated magnetic field = 1.2 KG-m
  - Every Nova cycle, we will have eight Mu2e pulses over 20 fifteen Hz ticks.
    - Duty cycle = 40%
    - Burst rate = 7.5Hz
  - Insertion Length = 3m
- Will install the kicker between the 5 and 6 quad locations.
- We will use three of the five magnet modules. The other two will be spares.
- We will need to make the PFNs shorter to decrease the flattop time.

### Mu2e era Debuncher Injection Kicker

- We will use the existing Pbar-era D:EKIK modules. It is believed the aperture, rise time and strength are all ok.
- A new power supply will need to be built.
- Kicker Specs
  - Flat top = 250 nsec
  - Rise time = 400 nsec
  - Fall time = 400 nsec
  - Total kick = 4.6 mrad
  - Magnets = 3
  - Integrated magnetic field = 1.3 KG-m
  - Every Nova cycle, we will have eight Mu2e pulses over 20 fifteen Hz ticks.
    - Duty cycle = 40%
    - Burst rate = 7.5Hz
  - Insertion Length = 3m
- The magnets will need to be radiation hardened. Greece used in the current magnets will break down under the radiation fields expected for Mu2e operations.

### Debuncher Abort Kicker

- Model after Booster Dump
  - The Booster runs 8GeV beam at ~26KW , and Mu2e is expected to run 8 GeV beam at 23KW.
  - The hope is we can model our Debuncher beam dump after the Booster system.
- The hope is to use the existing D:IKIK magnets
- The beam dump would be stacked in the AP2 line between the Debuncher and left bends.
- We would re-direct the abort line more to the center of the enclosure:
- g-2 compatibility
  - To make compatible with g-2, we would leave the AP2 line in place
  - We would have a switch magnet that would be off when g-2 ran beam from the AP2 line to the Debuncher, and on when we run beam from the Debuncher to the AP2 abort.
- Two operating scenarios
  - Clean-up: The kicker would need to fire at the end of every spill for cleanup
  - Abort: If the beam permit drops we would inhibit incoming beam and abort beam in the Debuncher.
    - It takes half of the 15Hz tick to charge the kicker.
- It should be noted that we will need to have a better protection system for our permit which we will rely on to inhibit incoming protons.
- Kicker Specs
  - Flat top > 1.6 microseconds
  - Rise time = 400 nsec
  - Fall time - doesn't matter

### Accumulator Abort Kicker

- We discussed one scenario of combining the Debuncher and Accumulator abort systems.
  - The aborted Accumulator beam would be kicked out the A/D line by the Mu2e era Accumulator extraction kicker.
  - Debuncher abort kicker would have its PFN lengthened to increase the time at flat top long enough to abort the Debuncher beam , followed by the Accumulator beam that gets transferred over.
  - This scenario was determined to not be possible since the Mu2e-era Accumulator extraction kicker has a short flattop that could not take out the full circumference of the beam.
  - Efforts to make a kicker with multiple flat top lengths are technically challenging, so we will look into making a separate abort system for the Accumulator.
- We are hoping:
  - Main use of abort is low duty cycle studies pulses.

- If the beam permit goes away, we are hoping it is good enough to inhibit incoming beam and not have to abort the existing beam in the Accumulator.
- Kicker Specs:
  - Flattop > 1.6 microsec
  - Rise time ?
  - Fall time ?

#### Septum

- We have not yet discussed what we are doing for septum in detail.
- Can we use the Booster Septum as a model? What field do they have?

#### To-do List:

- Morgan - Lattice location
- Vander - Check if Tevatron proton injection kicker systems will be available for us
- Drendel - write-up bullet point outline of our kicker plan.

#### Site Infrastructure:

- Radiation effects on our existing shunt systems?